IOT-BASED SMART PARKING SYSTEM

PHASE 1

PROJECT DEFINITION:

Finding parking spots for cars is one of the biggest issues in many large, busy cities. In this paper, we propose the design and development of a real smart parking system using IoT technology and mobile applications, which can provide more than just information about open spaces but also assist users in finding the space where the vehicle can be parked to lessen traffic in the parking area. Additionally, we employ computer vision to identify vehicle license plates in order to monitor the cars in the parking lot to improve security and to assist users in finding their cars when they are unsure of where they are parked. In our system, we've included a mobile payment feature to speed up the payment procedure and get rid of the payment bottleneck at the parking lot entrance/exit gate.

Keywords: computer vision, smart parking, and internet of things (IoT).

DESIGN THINKING:

1.PROJECT OBJECTIVES:

1. Maximizing Space Usage:

Smart parking technologies work to make the best possible use of existing parking spots. They lessen traffic and make sure that parking spaces are utilized to the fullest extent possible by effectively distributing parking places.

2. Lessening Traffic Congestion:

Time spent looking for parking contributes significantly to urban traffic congestion, which may be lessened with the use of smart parking. As a result, fuel usage and carbon emissions are reduced.

3. Improving User Experience:

Through mobile applications, real-time information, and digital signs, these systems seek to improve the driving experience for motorists by making it easier and quicker for them to find available parking spots.

4. Increasing Safety:

To improve the safety and security of parking facilities, some smart parking systems include features like surveillance cameras and emergency response systems.

5. Minimizing Environmental Impact:

Smart parking may lessen the amount of time that cars are left idle while looking for parking, hence reducing greenhouse gas emissions.

6. Reduction of unlawful Parking:

Smart parking systems can assist in discouraging and reducing unlawful parking through automated monitoring and enforcement.

2.IOT SENSOR DESIGN:

•Ultrasonic sensor — (HC-SR04):

This is used at each parking slots location to detect the vehicles within the range. The Raspberry Pi will forward detection to cloud, which is updated status available/unavailable.

• Camera — (Camera module V.1 for Raspberry Pi):

This is also used at each parking slots, and aware after occurred detection of sensor. Then vehicle is captured by camera in the parking slot.

• Raspberry Pi3:

This is controls data hardware, which sensor and camera can work together. Central interpreterdata from hardware (ultrasonic sensor and camera) to connection cloud database. These data are operated status of each parking slots, and cloud API for image recognition using deep neural network.

Second part, software system that consists Mobile application, cloud computing API and cloud database. These receive data transfer from first part to management then provide services to drivers.

• Mobile application:

this is software application mobile. Running on Android operating system, drivers will install on smart phones. They can access the via 3G/4G connection, which provided functional to checking status of parking slots, parking map area, notification massage and parking timer duration.

• Cloud:

first, cloud vision API is used for image analysis of camera captures vehicle at each parking slot, which extract license plate text within an image. Second, Cloud firebase record driver database such as name and vehicle license plate

In order to capture a picture of a vehicle's license plate, the system is developed with certain hardware devices for wall installation . This location is appropriate with sensor detection in/out inside the range of the parking slot, and it also controls the camera to switch on/off.

When driver drove into a parking slot, this the sensor measures distance range to detection that will turn on camera to preparation capture a car image

3.REAL-TIME TRANSIT INFORMATION PLATFORM:

Real-time parking availability mobile app interface design requires building a simple and user-friendly platform. Here is a step-by-step tutorial to assist you in creating this app:

Step 1: Identify User Needs and Goals

Understanding your consumers' goals for the app is essential before beginning the design process. Think on the question, What are users' primary goals for utilizing this app?

Step 2: Sketching and Wireframing

Start with creating preliminary wireframes or sketches to represent the app's design and functionality. The user flow and content organization are aided by this.

Think about the following components:

1. The home page

2. The results screen

3. The detail screen

Step 3:Design Components

Take into account the visual components that will make your app aesthetically pleasing and simple to use:

Use a color scheme that is straightforward and easy to understand. Red might represent full places whereas green can represent empty spots.

Typography: Use readable typefaces for the body text and headers.

Icons: For functions like search, filter, location, etc., use clear icons.

Use buttons with labels that are clear and actionable, such as "Search," "Filter," and "Book Now."

Step 4: Real-time Updates

Create a system to deliver real-time updates.This might entail connecting to a parking management system or using APIs that deliver real-time parking availability information.

Step 5: Flow and User Interactions

Make sure the user flow is clear: Implement seamless screen transitions.

Feedback for user activities should be provided (such as loading indications and success notifications).

Step 6: Testing and Comments

Make a test version of the app prototype. To find any usability faults or potential changes, get input from prospective users.

Step 7: Finalize and Develop

After you've integrated suggestions and made the required modifications, complete the design and provide it to developers so they can put it into practice.

Step 8: Onboarding and Support for Users

Create an onboarding procedure to walk users through the capabilities of the app. Give people choices for support if they run into problems by providing clear instructions.

4.INTEGRATION APPROACH:

You'll require a multi-step process to combine Raspberry Pi with sensors and update a mobile app. Here is a general description of the procedure:

1. Choose and Connect Sensors:

Select and connect sensors that are appropriate for your project and compatible with the Raspberry Pi.

2.Install Required Software:

On the Raspberry Pi, install the required sensor drivers and libraries. Depending on the sensor you use, this can need Python libraries or other computer languages.

3. Analyze sensor data:

To read data from the linked sensors, create a script in a computer language (like Python). The libraries that were installed in the previous stage will normally be used by this script.

4.Data Processing (Optional):

If necessary, process the raw data. Filtering, calibration, or any other data modification necessary for your particular application may fall under this category.

5.keep or Transmit Data:

You can choose to keep the data locally on the Raspberry Pi, transfer it to the cloud, or do both, depending on the needs of your project. Communication can be done via the HTTPS protocol.

6.Mobile App Integration:

Create a mobile app or use one that already exists if it satisfies your criteria.

Establish a communication protocol between the mobile app and the Raspberry Pi (Wifi) to establish communication.

7.submit and Receive Data:

Configure the mobile app to submit requests for sensor data and receive Raspberry Pi responses.

8.Data Presentation:

In the mobile app, process the data that the Raspberry Pi has sent. Additional processing, visualization, or any other display logic you require could be included in this. User Interface (UI) and User Experience (UX), error management, testing and debugging, deployment, and maintenance techniques can all be used to achieve this.